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मानक

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IS 6450 (1971): Rubbers for the Dairy Industry [PCD 13: Rubber and Rubber Products]



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“Knowledge is such a treasure which cannot be stolen”



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**IS: 6450 - 1971**

***Indian Standard***  
**SPECIFICATION FOR**  
**RUBBERS FOR THE DAIRY INDUSTRY**  
( First Reprint MARCH 1985 )

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**INDIAN STANDARDS INSTITUTION**  
**MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG**  
**NEW DELHI 110002**

**Gr 3**

**May 1972**

AMENDMENT NO. 1 JANUARY 1988

TO

IS:6450-1971 SPECIFICATION FOR RUBBERS  
FOR THE DAIRY INDUSTRY

(Page 9, clause 6.4) - Substitute the following  
for the existing clause:

'6.4 Compression Set - Compression set shall be  
determined in accordance with the method prescribed  
in IS:3400(Part X)-1977 at  $70 \pm 1^{\circ}\text{C}$  for  $24 \pm \frac{0}{2}$  hours.'

(PCDC 13)

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Reprography Unit, BIS, New Delhi, India

# *Indian Standard*

## SPECIFICATION FOR RUBBERS FOR THE DAIRY INDUSTRY

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**IS : 6450 - 1971**

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# *Indian Standard*

## SPECIFICATION FOR RUBBERS FOR THE DAIRY INDUSTRY

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 17 December 1971, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Chemical Division Council.

**0.2** Natural as well as synthetic rubbers are widely used in dairy equipment. This standard covers the whole range of rubber parts used in the dairy industry. This standard lays down the requirements for the various rubbers so that it will be possible to select a suitable type in the desired hardness range appropriate for the intended use. If the purchaser has any doubts on the right type of rubber for a specific application he should consult the rubber manufacturer.

**0.3** It has not been found possible to specify limits and tests for detection of toxic materials which are capable of extraction from the rubber in significant quantities during use. However, for the guidance of the manufacturers, the compounding ingredients which have been found to be suitable by practical experience are given in Appendix A.

**0.4** In the formulation of this standard considerable assistance has been derived from B.S. 1578:1965 'Specification for rubbers for the dairy industry' issued by British Standards Institution.

**0.5** This standard contains clauses 4.2 and 5.1 which call for agreement between the purchaser and the supplier.

**0.6** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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### 1. SCOPE

**1.1** This standard prescribes the requirements and methods of sampling and test for vulcanized non-oil resistant and oil resistant rubbers used in

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\*Rules for rounding off numerical values (*revised*).



## **IS: 6450-1971**

the manufacture of rubber parts for the dairy industry suitable for use up to  $-10^{\circ}\text{C}$ .

**NOTE**—The rubbers covered by this standard are adequately resistant to normal cleaning and sterilizing conditions.

**1.2** The design and dimensional requirements of rubber parts are not covered by this standard.

## **2. TYPES AND GRADES**

**2.1 Types**—This standard lays down the requirements for different types of rubber as follows:

- a) *Type* A0 to A5—Natural rubber or non-toxic general purpose synthetic rubber or blends thereof,
- b) *Type* B1 to B5—Acrylonitrile butadiene copolymer (NBR) non-staining or suitable blends with general purpose natural and synthetic rubbers, and
- c) *Type* C1 to C5—Polychloroprene rubbers.

**2.2 Grades**—The Type A rubbers shall be of two grades, namely, Grade 1 and Grade 2, depending on the physical properties.

## **3. REQUIREMENTS**

**3.1 General**—Rubber articles for use in dairy applications shall not contain substances known to be toxic and which are capable of extraction from the rubber in significant quantities by any dairy product or by water or by steam. The rubber used shall not impart any objectionable taste, taint or odour to dairy products. If desired by the purchaser the nature of the compounding ingredients shall be disclosed.

**3.2 Physical Requirements**—The material shall comply with the requirements specified in Tables 1 to 4 for different types and grades.

**3.3 Workmanship and Finish**—Rubber products shall be free from physical defects such as patches, porosity, embedded foreign matter and shall not show excessive bloom, when examined visually.

## **4. MARKING AND PACKING**

**4.1 Marking**—Individual rubber products for the dairy industry, wherever possible, shall be marked with the name of manufacturer or trade-mark, batch number, type and grade. Where it is not possible, marking shall be done on the package.

**TABLE 1 REQUIREMENTS FOR NON-OIL RESISTANT COMPOUNDS OF NATURAL RUBBER  
OR NON-TOXIC GENERAL PURPOSE SYNTHETIC RUBBER OR BLENDS THEREOF  
TYPES A0 TO A5, GRADE 1**

( Clause 3.2 )

Sl. No.	CHARACTERISTIC	REQUIREMENTS							
		Type A0	Type A1	Type A2	Type A3	Type A4	Type A5	Type A5	Type A5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
i)	Hardness, IRHD	$35 \pm 4$ $- 5$	$45 \pm 4$ $- 5$	$55 \pm 4$ $- 5$	$65 \pm 4$ $- 5$	$75 \pm 4$ $- 5$	$85 \pm 5$		
ii)	Tensile strength, kg/cm <sup>2</sup> , Min	175	175	140	140	105	85		
iii)	Elongation at break, percent, Min	700	600	500	350	250	150		
iv)	Compression set, percent, Max	35	30	30	30	35	35		
v)	Change in tensile strength after ageing for 7 days at 70°C in air oven, percent	$+ 10$ $- 20$	$+ 10$ $- 20$	$+ 10$ $- 20$	$+ 10$ $- 20$	$+ 10$ $- 20$	$+ 10$ $- 20$		
vi)	Change in elongation at break after ageing for 7 days at 70°C in air oven, percent	$+ 10$ $- 30$	$+ 10$ $- 30$	$+ 10$ $- 30$	$+ 10$ $- 30$	$+ 10$ $- 30$	$+ 10$ $- 30$		
vii)	Change in hardness after ageing for 7 days at 70°C in air oven, IRHD	$+ 10$ $- 2$	$+ 10$ $- 2$	$+ 10$ $- 2$	$+ 10$ $- 2$	$+ 10$ $- 2$	$+ 10$ $- 2$		
viii)	Change in volume after 24 hours in steam at 100°C, percent, Max	12	12	12	15	15	15		
ix)	Change in hardness after 24 hours in steam at 100°C, IRHD, Max	10	10	10	10	10	10		

**TABLE 2 REQUIREMENTS FOR NON-OIL RESISTANT COMPOUNDS OF NATURAL RUBBER OR NON-TOXIC GENERAL PURPOSE SYNTHETIC RUBBER OR BLENDS THEREOF TYPES A0 TO A5, GRADE 2**

(Clause 3.2)

Sl. No.	CHARACTERISTIC	REQUIREMENTS							
		Type A0	Type A1	Type A2	Type A3	Type A4	Type A5	Type A6	Type A7
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	Hardness, IRHD	35 + 4 - 5	45 + 4 - 5	55 + 4 - 5	65 + 4 - 5	75 + 4 - 5	85 ± 5		
ii)	Tensile strength, kgf/cm <sup>2</sup> , Min	110	110	105	105	85	70		
iii)	Elongation at break, percent, Min	500	500	400	300	200	100		
iv)	Compression set, percent, Max	40	35	35	35	40	40		
v)	Change in tensile strength after ageing for 7 days at 70°C in air oven, percent	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35		
vi)	Change in elongation at break after ageing for 7 days at 70°C in air oven, percent	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35	+ 10 - 35		
vii)	Change in hardness after ageing for 7 days at 70°C in air oven, IRHD	+ 10 - 2	+ 10 - 2	+ 10 - 2	+ 10 - 2	+ 10 - 2	+ 10 - 2		
viii)	Change in volume after 24 hours in steam at 100°C, percent, Max	15	15	15	20	20	20		
ix)	Change in hardness after 24 hours in steam at 100°C, IRHD, Max	15	15	15	15	15	15		

**TABLE 3 REQUIREMENTS FOR ACRYLONITRILE BUTADIENE COPOLYMER (NBR) NON-STAINING OR SUITABLE BLENDS WITH GENERAL PURPOSE NATURAL AND SYNTHETIC RUBBERS**  
**TYPES B1 TO B5**  
 ( Clause 3.2 )

Sl. No.	CHARACTERISTIC (2)	REQUIREMENTS				
		Type B1 (3)	Type B2 (4)	Type B3 (5)	Type B4 (6)	Type B5 (7)
i)	Hardness, IRHD	45 $\pm$ 4 — 5	55 $\pm$ 4 — 5	65 $\pm$ 4 — 5	75 $\pm$ 4 — 5	85 $\pm$ 5
ii)	Tensile strength, kgf/cm <sup>2</sup> , <i>Min</i>	70	70	70	70	70
iii)	Elongation at break, percent, <i>Min</i>	450	350	250	175	100
iv)	Compression set, percent, <i>Max</i>	30	30	30	30	30
v)	Change in tensile strength after ageing for 3 days at 100°C in air oven, percent	$\pm$ 25	$\pm$ 25	$\pm$ 25	+ 10 — 45	$\pm$ 25
vi)	Change in elongation at break after ageing for 3 days at 100°C in air oven, percent	+ 10 — 45	+ 10 — 45	+ 10 — 45	+ 10 — 45	+ 10 — 45
vii)	Change in hardness after ageing for 3 days at 100°C in air oven, IRHD	+ 8 — 2	+ 8 — 2	+ 8 — 2	+ 8 — 2	+ 8 — 2
viii)	Change in volume after swelling in butter oil for 24 hours at 100°C, percent, <i>Max</i>	5	5	5	5	5
ix)	Change in hardness after swelling in butter oil for 24 hours at 100°C, IRHD, <i>Max</i>	5	5	5	5	5
x)	Change in volume after 24 hours in steam at 100°C, percent, <i>Max</i>	10	10	10	10	10
xi)	Change in hardness after 24 hours in steam at 100°C, IRHD, <i>Max</i>	5	5	5	5	5

TABLE 4 REQUIREMENTS FOR POLYCHLOROPRENE RUBBER — TYPES C1 TO C5

( Clause 3.2 )

Sz No.	CHARACTERISTIC	REQUIREMENTS				
		Type C1	Type C2	Type C3	Type C4	Type C5
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Hardness, IRHD	45 + 4 — 5	55 + 4 — 5	65 + 4 — 5	75 + 4 — 5	85 ± 5
ii)	Tensile strength, kgf/cm <sup>2</sup> , <i>Min</i>	85	105	105	105	105
iii)	Elongation at break, percent, <i>Min</i>	450	350	250	200	100
iv)	Compression set, percent, <i>Max</i>	30	30	30	30	30
v)	Change in tensile strength after ageing for 3 days at 100°C in air oven, percent	± 25	± 25	± 25	± 25	± 25
vi)	Change in elongation at break after ageing for 3 days at 100°C in air oven, percent	+ 10 — 45	+ 10 — 45	+ 10 — 45	+ 10 — 45	+ 10 — 45
vii)	Change in hardness after ageing for 3 days at 100°C in air oven, IRHD	+ 8 — 2	+ 8 — 2	+ 8 — 2	+ 8 — 2	+ 8 — 2
viii)	Change in volume after swelling in butter oil for 24 hours at 100°C, percent, <i>Max</i>	40	30	30	20	20
ix)	Change in hardness after swelling in butter oil for 24 hours at 100°C, IRHD, <i>Max</i>	10	10	10	10	10
x)	Change in volume after 24 hours in steam at 100°C, percent, <i>Max</i>	15	15	15	15	15
xi)	Change in hardness after 24 hours in steam at 100°C, IRHD, <i>Max</i>	10	10	10	10	10

#### 4.1.1 The products may also be marked with the ISI Certification mark.

**NOTE**—The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

**4.2 Packing**—The material shall be packed as agreed to between the purchaser and the supplier so as to avoid damage during transit and deterioration in storage.

### 5. SAMPLING AND CRITERIA FOR CONFORMITY

**5.1** The sampling and criteria for conformity shall depend on the product and shall be as agreed to between the purchaser and the supplier.

### 6. TESTS

**6.1 Test Pieces**—Wherever possible the specified test pieces shall be cut from the finished article. Where this is impracticable, the manufacturer shall, if required, supply sheets of vulcanizate  $300 \times 300 \times 2.5$  mm and  $150 \times 150 \times 6.5$  mm prepared from the same batch and vulcanized to the same degree as the consignment concerned, from which the necessary test pieces can be prepared.

**6.2 Hardness**—Hardness shall be determined in accordance with the method prescribed in IS: 3400 (Part II)-1965\*.

**6.3 Tensile Strength and Elongation at Break**—Tensile strength and elongation at break shall be determined in accordance with the method prescribed in IS: 3400 (Part I)-1965† using Type I test piece.

**6.4 Compression Set**—Compression set shall be determined in accordance with the method prescribed in IS: 3400 (Part X)-1969‡ at  $70 \pm 2^\circ\text{C}$ .

**6.5 Swelling in Butter Oil**—The percentage of swelling shall be determined in accordance with the method prescribed in IS: 3400 (Part VI)-1967§ with the test pieces having a thickness of  $2.5 \pm 0.25$  mm. Butter oil to be used in this determination shall be prepared as described in 6.5.1.

\*Methods of test for vulcanized rubbers: Part II Hardness.

†Methods of test for vulcanized rubbers: Part I Tensile stress-strain properties.

‡Methods of test for vulcanized rubbers: Part X Compression set at constant strain.

§Methods of test for vulcanized rubbers: Part VI Resistance to liquids.

**6.5.1** Heat a portion of butter in a beaker to a temperature 50 to 60°C until the fat separates from the water and curd. Filter the fat layer through a dry filter paper into a dry vessel. If necessary re-filter the filtrate under the same conditions until it is clear and free from water.

**6.6 Hardness After Swelling in Butter Oil**—Hardness in IRHD shall be determined in accordance with the method prescribed in IS:3400 (Part II)-1965\* after the test piece has been subjected to swelling in butter oil for 24 hours at  $100 \pm 2^\circ\text{C}$ .

**6.7 Volume Change in Steam**—Determine the volume change in accordance with IS:3400 (Part VI)-1967† after exposure of a test piece of thickness  $2.5 \pm 0.25$  mm to steam at  $100^\circ\text{C}$  for a period of 24 hours. The test piece shall be cooled for 30 minutes in water before the measurements are carried out.

**6.8 Hardness After 24 h Steam Ageing at  $100^\circ\text{C}$** —Determine the hardness in IRHD of the test piece in accordance with the method prescribed in IS:3400 (Part VI)-1967†.

**6.9 Hardness After Accelerated Ageing**—Determine the hardness in IRHD after ageing for 7 days at  $70^\circ\text{C}$  in an air oven in accordance with the method prescribed in IS:3400 (Part IV)-1965‡.

**6.10 Tensile Strength and Elongation at Break After Accelerated Ageing**—Age the samples in an air oven in accordance with IS:3400 (Part IV)-1965‡ for the time and at the temperature as indicated in Tables 3 and 4. Determine tensile strength and elongation at break of the aged sample in accordance with the method prescribed in IS:3400 (Part I)-1965§.

## **A P P E N D I X    A**

*( Clause 0.3 )*

### **RECOMMENDED COMPOUNDING INGREDIENTS**

#### **A-1. GENERAL**

**A-1.1** In giving the following data it is not intended to imply that the use of alternative materials may not give compounds of a suitable quality. The recommendations are, in every case, intended mainly to indicate types of materials which have been found, by practical experience, to be suitable in normal quantities.

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\*Methods of test for vulcanized rubbers: Part II Hardness.

†Methods of test for vulcanized rubbers: Part VI Resistance to liquids.

‡Methods of test for vulcanized rubbers: Part IV Accelerated ageing.

§Methods of test for vulcanized rubbers: Part I Tensile stress-strain properties.

## A-2. ACCELERATORS

**A-2.1** Recommended accelerators of the tasteless type are thiuram disulphides or monosulphides, dithiocarbamates and suitable polyamines.

## A-3. ANTIOXIDANTS

**A-3.1** Where it is considered that an antioxidant be employed, the following materials are recommended:

- a) Condensation products of acetone and aniline, and
- b) Di- $\beta$ naphthyl-*p*-phenylenediamine ( symmetric ).

## A-4. FILLERS

**A-4.1** The following are recommended:

- a) *China Clay* — see IS : 505-1968\*.
- b) *Barytes* — see IS : 1683-1960†.
- c) *Blanc Fixe*
- d) *Kieselguhr*
- e) *Silica*
- f) *Whiting* — see IS : 1685-1960‡.
- g) *Carbon Black*

## A-5. SOFTENERS

**A-5.1** The following are recommended:

- a) *Stearic Acid* — see IS : 1675-1960§.
- b) *Petroleum Jelly*
- c) *Light Coloured Non-Staining Mineral Oil*

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\*Specification for light kaolin (*first revision* ).

†Specification for barytes for rubber industry.

‡Specification for whiting for rubber industry.

§Specification for stearic acid, technical.



# INDIAN STANDARDS INSTITUTION

## Headquarters

Menak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002

Telephones : 26 60 21, 27 01 31

Telegrams : Manaksanstha (Common to all Offices)

## Regional Offices

		Telephone
*Western	Manakalaya, E9 MIDC, Marol Andheri (East) BOMBAY 400093	6 32 92 95
†Eastern	1/14 C. I. T. Scheme VII M V I P Road Maniktole CALCUTTA 700054	36 24 99
Southern	C. I. T. Campus MADRAS 600113	41 24 42
Northern	B69 Phase VII Industrial Focal Point S A S NAGAR 160051 ( Punjab )	8 73 28

## Branch Offices

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	AHMADABAD 380001	
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Institution of Engineers (India) Building	5 24 35
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